

Attorney's Docket No.: 14723-008001

In the claims:

1. (Currently Amended) A method of transmitting optical signal traffic, comprising:

providing an all optical network with at least two rings that are geographically dispersed, each ring including at least one transmitter and at least one receiver;

separating the available wavelengths into distinct ring bands;

sharing the optical signal traffic throughout the entire optical network; and

A2 providing each ring with its own distinct ring band of the optical signal traffic, wherein all of the optical signal traffic is transmittable throughout the optical network and each receiver is configured to receive only wavelengths in a ring band designated for its associated ring; and

providing each receiver with a hierarchical mechanism to separate received light at different signal wavelengths within a designated ring band into a plurality of separate optical signals each having a plurality of signal channels and to filter each separate optical signal to extract a selected signal channel.

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2. (Original) The method of claim 1, wherein all of the ring bands have a same number of optical signals.

3. (Original) The method of claim 1, wherein at least a portion of the ring bands have a same number of optical signals.

4. (Original) The method of claim 1, wherein all of the ring bands have a different number of optical signals.

5. (Original) The method of claim 1, wherein at least a portion of the ring bands have different numbers of optical signals.

6. (Original) The method of claim 1, wherein none of ring bands share common wavelengths.

7. (Original) The method of claim 1, wherein all of the optical network traffic is included in the ring bands.

8. (Original) The method of claim 1, wherein each ring includes at least two nodes.

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9. (Original) The method of claim 8, wherein each node includes at least one transmitter and one receiver.

10. (Original) The method of claim 1, wherein each ring in the optical network includes at least a first and a second fiber with all of the optical signal traffic traveling in both of the first and second fibers, wherein the optical signal traffic travels in a clockwise direction in the first fiber and in a counter-clockwise direction in the second fiber.

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11. (Original) The method of claim 1, wherein the first and second protection fibers are each coupled to a 1x1 or 1x2 switch.

12. (Original) The method of claim 11, further comprising: maintaining the 1x1 or 1x2 switch in an open position when there is no break point in an associated ring, and closing the 1x1 or 1x2 switch upon an occurrence of a break point in the associated ring.

13. (Original) The method of claim 12, further comprising: discovering a break point in an ring by monitoring an optical supervision signal that travels through the associated ring.

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14. (Original) The method of claim 1, wherein the optical network includes a 1x2 band-splitter and a 2x1 coupler that couples the optical signal traffic between the at least two rings.

15. (Original) The method of claim 1, further comprising:  
coupling the optical signal traffic between the at least first and second rings through the 1x2 band-splitter and the 2x1 coupler.

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16. (Original) The method of claim 1, wherein each ring in the optical network includes a fiber with the same signal traffic duplicated in two different bands that travel in both clockwise and counter-clockwise directions.

17. (Original) The method of claim 1, wherein the optical network includes, first, second and third rings, each ring including a first and a second protection fibers with all of the optical signal traffic traveling in both of the first and second protection fibers, wherein the optical signal traffic travels in a clockwise direction in the first protection fiber and in a counter-clockwise direction in the second protection fiber.

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18. (Original) The method of claim 17, wherein each of the first and second protection fibers is coupled to a 1x1 switch.

19. (Original) The method of claim 1, wherein the optical network further includes a first and second MxM optical switches, where M is the total number of ring bands.

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20. (Original) The method of claim 19, further comprising:  
coupling the optical signal traffic between the at least first and second rings with the first and second MxM switches, wherein the first MxM switch routes the optical signal traffic in a clockwise direction, and the second MxM switch routes the optical signal traffic in a counter-clockwise direction.

21. (Currently Amended) A method of transmitting optical traffic, comprising:

providing an all optical network with at least two rings that are geographically dispersed, each ring including at least one transmitter and at least one receiver;

sharing a sufficiently large enough number of wavelengths in the at least two rings to eliminate O-E-O conversions between the rings;

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sharing the optical signal traffic throughout the entire optical network; ~~and~~

providing each ring with its own distinct ring band of the optical signal traffic, wherein all of the optical signal traffic is transmittable throughout the optical network and each receiver is configured to receive only wavelengths in a ring band designated for its associated ring; and

providing each receiver with a hierarchical mechanism to separate received light into a plurality of separate optical signals each having a plurality of channels and to filter each separate optical signal to extract a selected channel.

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22. (Original) The method of claim 21, wherein all of the ring bands have a same number of optical signals.

23. (Original) The method of claim 21, wherein at least a portion of the ring bands have a same number of optical signals.

24. (Original) The method of claim 21, wherein all of the ring bands have a different number of optical signals.

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25. (Original) The method of claim 21, wherein at least a portion of the ring bands have different numbers of optical signals.

26. (Original) The method of claim 21, wherein none of ring bands share common wavelengths.

27. (Original) The method of claim 21, wherein all of the optical network traffic is included in the ring bands.

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28. (Original) The method of claim 21, wherein each ring includes at least two nodes.

29. (Original) The method of claim 28, wherein each node includes at least one transmitter and one receiver.

30. (Original) The method of claim 21, wherein each ring in the optical network includes at least a first and a second fibers with all of the optical signal traffic traveling in both of the first and second fibers, wherein the optical signal traffic travels in a clockwise direction in the first fiber and in a counter-clockwise direction in the second fiber.

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31. (Original) The method of claim 21, wherein the first and second protection fibers are each coupled to a 1x1 or 1x2 switch.

32. (Original) The method of claim 31, further comprising: maintaining the 1x1 or 1x2 switch in an open position when there is no break point in an associated ring, and closing the 1x1 or 1x2 switch upon an occurrence of a break point in the associated ring.

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33. (Original) The method of claim 32, further comprising: discovering a break point in an ring by monitoring an optical supervision signal that travels through the associated ring.

34. (Original) The method of claim 21, wherein the optical network includes a 1x2 band-splitter and a 2x1 coupler that couples the optical signal traffic between the at least two rings.

35. (Original) The method of claim 21, further comprising:

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coupling the optical signal traffic between the at least first and second rings through the 1x2 band-splitter and the 2x1 coupler.

36. (Original) The method of claim 21, wherein each ring in the optical network includes a fiber with the same signal traffic duplicated in two different bands that travel in both clockwise and counter-clockwise directions.

37. (Original) The method of claim 21, wherein the optical network includes, first, second and third rings, each ring including a first and a second protection fibers with all of the optical signal traffic traveling in both of the first and second protection fibers, wherein the optical signal traffic travels in a clockwise direction in the first protection fiber and in a counter-clockwise direction in the second protection fiber.

38. (Original) The method of claim 37, wherein each of the first and second protection fibers is coupled to a 1x1 switch.

39. (Original) The method of claim 21, wherein the optical network further includes a first and second MxM optical switches, where M is the total number of ring bands.

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40. (Original) The method of claim 39, further comprising:  
coupling the optical signal traffic between the at least  
first and second rings with the first and second MxM switches,  
wherein the first MxM switch routes the optical signal traffic  
in a clockwise direction, and the second MxM switch routes the  
optical signal traffic in a counter-clockwise direction.

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41. (Currently Amended) A method of transmitting optical  
signal traffic, comprising:  
providing an all optical network with hierarchical rings,  
each ~~of a~~ hierarchical ring including a plurality of nodes and  
each node including at least one transmitter and one receiver;  
separating the optical signal traffic into ring bands;  
transmitting the optical signal traffic through all of the  
hierarchical rings; and

providing each hierarchical ring with its own distinct ring  
band, wherein all of the available wavelengths are transmittable  
throughout each hierarchical ring, and the receivers of a  
hierarchical ring are configured to receive only wavelengths in  
a ring band that is designated for that hierarchical ring.

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42. (Currently Amended) An all optical network for optical signal traffic, comprising:

at least a first and a second ring, each ring having at least one transmitter and one receiver and its own distinct ring band of the optical signal traffic, wherein all of the optical signal traffic is transmittable throughout the entire all optical network and each receiver is configured to receive only wavelengths in a ring band designated for its associated ring; and

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conf* a central hub that couples the at least first and second rings, the central hub separating the optical signal traffic into ring bands,

wherein each receiver in each ring comprises a hierarchical mechanism which comprises at least one optical element operable to separate received light into a plurality of separate optical signals each having a plurality of signal channels, and a plurality of optical filters optically coupled to receive and filter the separate optical signals, respectively, to extract respective selected signal channels.

43. (Original) The all optical network of claim 42, wherein each ring includes at least a first and a second protection fibers that carry all of the optical signal traffic, wherein the

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optical signal traffic travels in a clockwise direction in the first protection fiber and in a counter-clockwise direction in the second protection fiber.

44. (Original) The all optical network of claim 42, wherein at least one 1x1 or 1x2 switch is coupled to each first and second protection fiber.

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45. (Original) The all optical network of claim 44, wherein each 1x1 or 1x2 switch is maintained in an open position when there is no break point in an associated ring, and each 1x1 or 1x2 switch is closed upon an occurrence of a break point in the associated ring.

46. (Original) The all optical network of claim 42, wherein the central hub includes at least one 1x2 band-splitter and a 2x1 coupler that couple the optical signal traffic between the at least first and second rings.

47. (Original) The all optical network of claim 42, further comprising: first and second MxM optical switches, where M is the total number of ring bands.

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48. (Original) The all optical network of claim 42, wherein each ring includes multiple nodes.

49. (Original) The all optical network of claim 48, wherein each node includes at least one transmitter and one receiver.

50. (Original) The all optical network of claim 42, further comprising:

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at least one mesh-based long haul network coupled to the at least first and second rings.

51. (Original) The all optical network of claim 42, wherein the at least first and second rings are geographically dispersed.

52. (Original) The all optical network of claim 42, wherein the at least first and second rings are hierarchical rings.

53. (Original) The all optical network of claim 42, wherein each of the at least first and second rings includes a 2x1 coupler for adding traffic and a 1x2 coupler for dropping traffic.

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54. (Original) The all optical network of claim 53, further comprising;

a broadband gain-equalizer and a gain-clamped optical amplifier positioned between the first 2x1 coupler and the second 1x2 coupler of the at least first and second rings.

55. (Original) The all optical network of claim 42, wherein all of the ring bands have a same number of optical signals.

56. (Original) The all optical network of claim 42, wherein at least a portion of the ring bands have a same number of optical signals.

57. (Original) The all optical network of claim 42, wherein all of the ring bands have a different number of optical signals.

58. (Original) The all optical network of claim 42, wherein at least a portion of the ring bands have different numbers of optical signals.

59. (Original) The all optical network of claim 42, wherein none of ring bands share common wavelengths.

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60. (Original) The all optical network of claim 42, wherein all of the optical network traffic is included in the ring bands.

61. (Currently Amended) An all optical network, comprising:  
a first ring with at least a first and a second protection fibers that carry all of the optical signal traffic, wherein the optical signal traffic travels in a clockwise direction in the first protection fiber and in a counter-clockwise direction in the second protection fiber, and

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at least one 1x1 or a 1x2 switch coupled to each of the first and second protection fibers, wherein the 1x1 or 1x2 switch is maintained in an open position when there is no break point in the ring and closed upon an occurrence of a break point in the ring, and

at least one node in the first ring comprising at least one optical element operable to separate received light into a plurality of separate optical signals each having a plurality of signal channels, and a plurality of optical filters optically coupled to receive and filter the separate optical signals, respectively, and to extract respective selected signal channels.

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62. (Original) The all optical network of claim 61, wherein each ring includes multiple nodes.

63. (Original) The all optical network of claim 62, wherein each node includes at least one transmitter and one receiver.

64. (Currently Amended) A method of transmitting optical ring traffic, comprising:

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omit* providing a broadcast-and-select optical network comprising at least one fiber ring; and

transmitting signal channels at different channel wavelengths in the fiber ring;

using a broadband optical splitter in the fiber ring to split a portion of optical power in the fiber ring to produce an optical drop signal having all of the signal channels;

separating the optical drop signal into a plurality of individual optical signals each having a plurality of signal channels;

filtering each individual optical signal to extract a selected signal channel; and

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transmitting a sufficient number of wavelengths over a long distance in the optical network to eliminate wavelength converters and regenerators between rings in a network.

65. (Original) The method of claim 64, wherein the number of wavelengths transmitted over the long distance is sufficient to eliminate OADMs in a ring-to-ring interconnecting network.

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66. (Original) The method of claim 64, wherein the number of wavelengths transmitted over the long distance is sufficient to eliminate OADMs in a ring-to-mesh interconnecting network.

67. (New) An optical network, comprising:

at least one optical fiber ring to carry the same optical traffic in two opposite directions, wherein the optical traffic includes signal channels at different optical channel wavelengths;

a plurality of nodes on the fiber ring, each node comprising:

an optical power splitter optically coupled to the fiber ring to split a portion of optical power in the fiber ring to produce an optical drop signal having all the channels and to allow for the optical traffic to continue in the fiber ring,

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an optical device to receive the optical drop signal and to separate optical drop signal into a plurality of separate optical signals each having a plurality of signal channels, and

a plurality of optical filters optically coupled to receive and filter the separate signal channels, respectively, and to extract respective selected signal channels; and

an optical switch module optically engaged in the fiber ring to maintain a break point in the fiber ring so that light in the fiber ring cannot re-circulate in a closed optical loop.

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68. (New) The network as in claim 67, wherein the optical switch module operates to create a break point in a path of light when light passing through the optical switch module does not encounter a break point elsewhere in the fiber ring, and the optical switch module operates to close the break point when light passing through the optical switch module encounters a break point elsewhere in the fiber ring.

69. (New) The network as in claim 67, wherein the optical device comprises a plurality of fixed wavelength selectors at different wavelength bands so that the separate optical signals have signal channels in different wavelength bands, respectively, the network further comprising:

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a plurality of optical power splitting devices coupled to receive the channel groups, respectively, wherein each optical power splitting device separates a corresponding channel group into a plurality of signals each having all channels in the corresponding channel group.

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com. 70. (New) The network as in claim 67, wherein the optical device comprises a plurality of tunable OADM devices optically connected in series, the tunable OADM filters respectively filtering the optical drop signal to produce the separate optical signals each having signal channels different from signal channels in another separate optical signal.

71. (New) The network as in claim 67, wherein the optical device comprises a power beam splitter to separate the optical drop signal into the separate optical signals each having signal channels identical to signal channels in another separate optical signal.

72. (New) The network as in claim 67, wherein each optical filter is a tunable optical filter operable to tune to a selected signal channel and to select the selected signal channel.

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73. (New) The network as in claim 1, wherein at least one node in the fiber ring further comprises:

a plurality of laser transmitters to produce new signal channels at different wavelengths;

an optical multiplexer to receive and combine the new signal channels; and

an adding optical splitter optically coupled to the fiber ring to add the new signal channels from the optical multiplexer to the fiber ring.

74. (New) The network as in claim 73, wherein each laser transmitter is a tunable laser.

75 76. (New) The network as in claim 73, wherein each laser transmitter is a laser operates at a fixed laser wavelength.

76 77. (New) The network as in claim 67, wherein the fiber ring comprises two separate fiber loops that carry the same optical traffic in two opposite directions, respectively.

77 78. (New) The network as in claim <sup>76</sup>77, wherein the optical switch module is optically coupled to both of the two fiber

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loops to cause a break point in each of the two fiber loops where there is no break point elsewhere in each fiber loop.

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79. (New) The network as in claim 78, further comprising a central hub in the fiber ring that controls the traffic in the two fiber loops, and wherein the optical switch module is located within the central hub.

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80. (New) The network as in claim 79, further comprising at least one secondary optical switch in each of the two fiber loops outside the central hub.

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81. (New) The network as in claim 80, wherein the secondary optical switch in each fiber loop is located within a node.

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82. (New) The network as in claim 67, wherein the fiber ring comprises a single fiber loop to carry the traffic in two opposite directions.

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83. (New) The network as in claim 82, further comprising a central hub in the fiber ring that controls the traffic in the two fiber loops, and wherein the optical switch module is located within the central hub.

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~~84~~. (New) The network as in claim <sup>82</sup>~~83~~, further comprising at least one secondary optical switch in the single fiber loop outside the central hub.

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~~85~~. (New) The network as in claim <sup>83</sup>~~84~~, wherein the secondary optical switch is located within a node.

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